Question Paper Code : 30050

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2026.

Second Semester

Aeronautical Engineering

EE25C01 – BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to : Aerospace Engineering/Automobile Engineering/ Civil Engineering/Civil Engineering (Environmental Engineering)/ Computer Science and Design/Computer Science and Engineering/Computer Science and Engineering(Artificial Intelligence and Machine Learning/Computer Science and Engineering(Cyber Security)/ Computer Science and Engineering (Data Science)/Computer Science and Engineering(IoT)/Computer and Communication Engineering/ Environmental Engineering/Environmental Science and Technology/ Geoinformatics Engineering/ Industrial Engineering and Management/Manufacturing Engineering/Marine Engineering/ Mechanical Engineering/Mechanical Engineering (Specialised in Automobile)/Mechanical Engineering (Specialised in Smart Manufacturing)/ Mechanical and Automation Engineering/Mechatronics Engineering/ Robotics and Artificial Intelligence/Robotics and Automation/ Industrial Biotechnology/Agricultural Engineering/Artificial Intelligence and Data Science/Bio Technology/Chemical Engineering/Chemical and Electrochemical Engineering/Computer Science and Business Systems/Fashion Technology/ Food Technology/Handloom and Textile Technology/Information Technology/Petrochemical Technology/Petroleum Engineering/ Pharmaceutical Technology/Plastic Technology/Textile Chemistry/ Textile Technology)

(Regulations 2025)

Time : 3 hours Maximum : 100 marks

CO – Course Outcomes

CO1	Understand and explain basic electrical and electronic concepts.
CO2	Apply and analyse electrical circuits in real-time applications.
CO3	Identify and utilise key electronic devices used in engineering applications.

BL – Bloom's Taxonomy Levels

(L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create)

Answer ALL questions.

PART – A (Total Marks = 40)

[Q. No. 1 to Q. No. 10 ; 10 × 1 = 10 Marks (Multiple Choice Questions)

Q. No. 11 to Q. No. 20; 10 × 3 = 30 Marks]

Q.No.	Questions	Marks	CO	BL
1.	An ideal current source has (A) Infinite internal resistance (B) Zero internal resistance (C) Infinite voltage (D) Zero current	1	1	1
2.	Equivalent resistance in parallel is (A) Always greater than largest resistor (B) Always less than smallest resistor (C) Equal to sum of resistances (D) Zero always	1	1	2
3.	Two AC signals have same RMS value but different peak values. This implies (A) Same waveform shape (B) Different waveform shapes (C) Same frequency (D) Zero phase difference	1	1	4
4.	A fuse protects circuit by ———— (A) Increasing resistance (B) Melting due to overcurrent (C) Reducing voltage (D) Increasing current	1	2	2
5.	BLDC motor uses (A) Brushes (B) Commutator (C) Electronic commutation (D) Slip rings	1	2	2

6.	A stepper motor has 200 steps per revolution. The step angle is (A) 0.9° (B) 1.8° (C) 3.6° (D) 7.2°	1	2	5
7.	Zener diode operates in (A) Forward bias (B) Reverse breakdown (C) Cut-off (D) Saturation	1	3	1
8.	BJT operates as an amplifier in (A) Cut-off region (B) Saturation region (C) Active region (D) Breakdown region	1	3	1
9.	The complement of $(A + B + C)(A + B + C)(A + B + C)$ is (A) $A' + B' + C'$ (B) $A'B'C'$ (C) $AB'C$ (D) $A + B + C$	1	3	5
10.	If a microcontroller executes instructions faster due to separate buses, it follows (A) Von Neumann architecture (B) Harvard architecture (C) Serial architecture (D) Pipeline architecture	1	3	1
11.	Three resistors are connected in series across a 12 V battery. The first resistor is 1 Ω, second has a voltage drop of 4 V and third has power dissipation of 12 W. Calculate the current in the circuit.	3	1	5
12.	A toroidal air cored coil with 2000 turns has a mean radius of 25 cm, the diameter of each turn being 6 cm. If the current in the coil is 10 A. find (a) MMF, (b) flux and (c) flux density.	3	2	5

13.	Draw the impedance triangle of an A.C. circuit and explain in brief the relationship between resistance, reactance, and impedance. Derive the expression for impedance and phase angle.	3	1	6
14.	What is CPR? Explain in brief the step involved in performing Cardiopulmonary Resuscitation for a person who has suffered electric shock.	3	2	2
15.	Provide the relationships between line voltage and phase voltage in the three-phase star and delta connected systems.	3	1	5
16.	Differentiate between Zener and Avalanche breakdown.	3	3	4
17.	List the ideal characteristics of an operational amplifier.	3	3	1
18.	How is D flip flop operated in toggle mode?	3	3	4
19.	Provide the truth table and logic diagram of 4:1 Multiplexer.	3	3	1
20.	What is an interrupt? Explain its types and importance in real-time systems.	3	3	4

PART – B (5 × 12 = 60 marks)

Q.No.		Questions	Marks	CO	BL
21.	(a)	(i) A circuit consists of 3 resistors 3Ω, 4Ω and 6 Ω parallel and a fourth resistor 4Ω in series. A battery of emf 12 V and internal resistance 6Ω is connected across the circuit. Find the total current in the circuit and terminal voltage across the battery.	8	1	5
		(ii) With relevant circuits and expressions demonstrate the voltage division and current division rules.	4		
		OR			

	(b)	(i) A circuit shown in Fig. 1 has a 20 V DC supply feeding a voltage divider ($R_1 = 5\,k\Omega, R_2 = 5\,k\Omega$). The midpoint of the divider is connected to a parallel network consisting of $R_3 = 10\,k\Omega$ and $R_4 = 20\,k\Omega$.	6	1	5

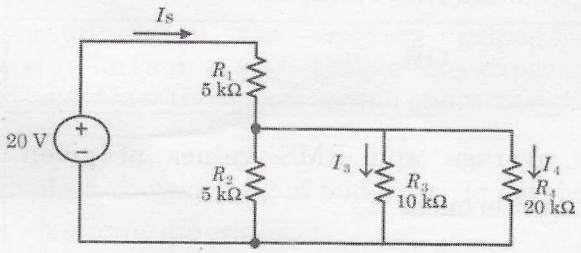

Fig. 1

(1) Find voltage at midpoint using VDR.

(2) Use CDR to find current through R_3 and R_4.

(3) Explain how voltage division affects current division in this network.

(ii) With relevant expressions, explain the transient behavior of inductors and capacitors in DC circuits when a switch is closed. Draw and explain the response. — 6

22.	(a)	(i) Find the average values of given waveforms	6	1	5

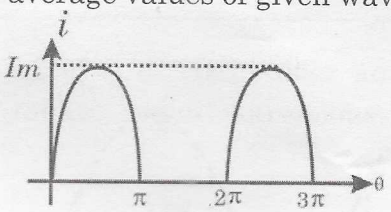

Fig. 2

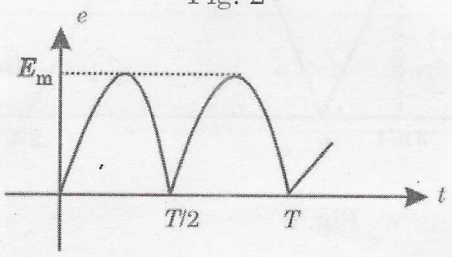

Fig. 3

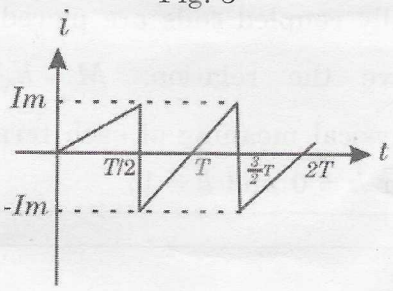

Fig. 4

		(ii) Explain the generation of sinusoidal voltage using a rotating coil in a magnetic field Derive the equation : $e = E_m \sin \omega t$. Also explain the effect of speed and flux variation.	6		
		OR			
	(b)	(i) Find the average and RMS values of given waveforms in terms of E_m .	6	1	5

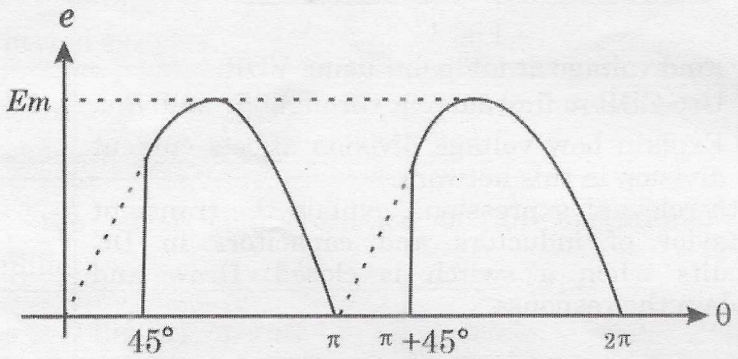

Fig. 5

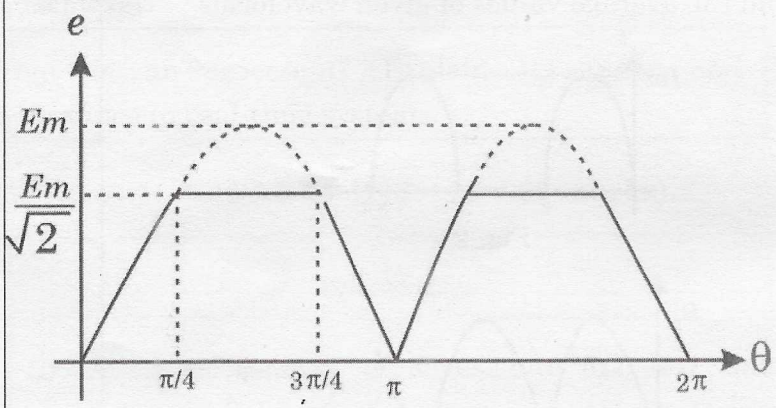

Fig. 6

		(ii) Two magnetically coupled coils are placed close together. Derive the relation: $M = k\sqrt{L_1 L_2}$. Explain the physical meaning of each term and discuss cases for $k = 0$ and $k = 1$.	6		

23.	(a)	Explain in detail the construction and working of a DC motor. Derive the expression for back emf and discuss its significance.	12	2	4
		OR			
	(b)	Discuss in detail the working principle of a 3-phase induction motor. Derive the expression for torque and draw the speed-torque characteristics.	12	2	4
24.	(a)	(i) Explain the working of 555 timer in astable mode with circuit diagram. (ii) Explain the working of a Zener diode as a voltage regulator.	6 6	3	1
		OR			
	(b)	Explain the construction, working, and characteristics of BJT in common emitter configuration. Also derive the relation between α, β and γ.	12	3	1
25.	(a)	Explain the working of Half Adder and Full Adder with truth tables, logic expressions, and circuit diagrams.	12	3	1
		OR			
	(b)	Draw and explain the block diagram of a microcontroller architecture.	12	3	1